August 22, 2003

Ms. Marlene H. Dortch

Secretary

Federal Communications Commission

445 12th Street, S.W.

Washington, DC 20554

Notice of Written Ex Parte Presentation

Re: In the Matter of Additional Spectrum for Unlicensed Devices below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380

Dear Ms. Dortch:

Intel Corporation previously filed Comments and Reply Comments in the above referenced Notice of Inquiry. In those pleadings we recommended that the FCC expeditiously begin a Notice of Proposed Rulemaking that would permit the use of unlicensed devices on certain TV broadcast channels. We recommended that at a minimum the rulemaking should consider authorizing unlicensed operation within the bands 76-216 MHz (channels 5-13), 512-608 MHz (21-36), and 614-698 MHz (38-51), by devices whose operating parameters are defined as a function of the Broadcast TV environment in which they are located.

After reviewing the record in this NOL, we are writing to provide supplemental analysis for the purpose of clarifying two key issues: (1) the availability of vacant channels and (2) the separation distance of unlicensed devices to TV receiver antennas. Regarding the first issue, an

analysis clearly demonstrates that in the bands advocated by the majority of respondents to the NOI (channels 5-13, and 21-51 with the exception of 37) sufficient vacant channels exist to make sharing of the TV spectrum attractive to alternative service providers. Regarding the second issue, further analysis shows that unlicensed devices could be operated as close as 1 meter to a TV receiver without causing interference.

The Attachment, prepared by Intel engineers Michael Chartier, Jeff Schiffer and Alan Waltho, provides in depth analysis documenting these conclusions. Accordingly, Intel recommends that the Commission expeditiously begin a rulemaking proposing to permit unlicensed use of the broadcast television frequencies.

Respectfully submitted,

/s/ Peter K. Pitsch
Intel Corporation
Director, Communications Policy

Cc:

Ed Thomas, Chief
Bruce Franca, Deputy Chief
Julius Knapp, Deputy Chief
Jim Schlichting, Deputy Chief
Michael Marcus, Associate Chief
Alan Scrime, Chief, Policy & Rules
Hugh Van Tuyl

Attachment

1. Channel Availability

Notwithstanding the contentions of the NAB, vacant channels are available in major metropolitan areas. With the transition to DTV and various other changes in the broadcast community neither the number of channels in a particular location nor the actual channel assignments are fixed. Consistent with the NOI Intel believed "that an unlicensed device operating in the TV band should have certain capabilities to avoid causing interference to licensed services"[1], including the "able identify unused frequency bands before it can transmit". Therefore, Intel assumed unlicensed devices would have a capability to scan the spectrum for vacant channels and to monitor and log the nature of the channels adjacent to the vacant channel. In Intel's reply comments we addressed the hidden receiver case, and showed that enhanced sensitivity for monitoring of active TV channels, was feasible. For example, an easily implemented 6 Khz filter could give 30 dB greater sensitivity relative to the 6 MHz bandwidth.[2]

Using this information unlicensed devices would be able to make decisions on which vacant channel to operate at a given location. In addition, the unlicensed device could adjust its own emissions relative to the signal strength in the two adjacent channels so as to not cause interference to nearby TV receivers listening on those adjacent channels. By embedding this capability into unlicensed devices, vacant channel selection could be performed based on the actual coverage of TV stations in the area rather than specified nominal range calculations and criteria. Thus, the actual device operation decisions could automatically incorporate terrain factors as well as the height and power of the TV transmitter.

Based on the proposed unlicensed device features mentioned above, Intel conducted a more in depth analysis to demonstrate that when actual TV transmitter locations, power levels, and elevations are used there would still be a significant number of available channels throughout most metropolitan districts. This analysis was conducted for the Bay Area of California and Washington DC, two areas which have different terrain conditions, and were used as examples in our previous reply comments.

Parameters: This coverage analysis used the Digital Terrain Data Base within a propagation prediction program called, RADIO MOBILE Version 4.1 as described in; "A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode", National Telecommunications and Information Administration (NTIA) Report 82-100, by Georges A. Hufford, Anita G. Longley and William A. Kissick. It was conducted at a frequency 500 MHz from a broadcast site to a mobile receiver and the power was set for minimum field strength of 64μV/m. The analysis focused on NTSC channels. But DTV channels are required to have the same footprint as the

[1] See NOI @ 16
[2] See Intel Reply Comment @ 11

paired NTSC channel. Therefore, the results of NTSC analysis should be applicable to DTV channels. To be conservative we set the mode variability to 50% time, 50% locations and 50% situations. These conditions are far below the reliability normally required for acceptable TV reception and would therefore result in an increase in the predicted coverage area. Sample coverage diagrams are shown in the Appendix.

Results: Based on the coverage from all TV stations listed for the Bay Area in the Consolidated Database System (**CDBS**) electronic filing system for Broadcast Station Application Forms, the analysis shows that virtually no areas exist where all stations can be received at a signal level above the grade B contour level. By superimposing the relevant TV coverage contours over recent aerial photographs of the Bay, we determined that those small areas where reception from most TV transmitter sites is possible have high elevations and few if any residential buildings. This analysis demonstrated that at a minimum six vacant channels between channels 20 and 51 could be identified throughout virtually all of the residential areas in and around the metropolitan district.

Similar analysis of the Washington DC region resulted in a minimum of 2 vacant channels in a small area south east of Washington and at least 6 vacant channels throughout most of the metropolitan region from Richmond to Baltimore. Considering that 802.11b and 802.11g provide only three orthogonal channels the availability of 6 orthogonal channels would represent a significant gain in spectrum for unlicensed devices.

2. Separation Distance from a TV Receiver Antenna

The NAB also claimed that Intel required a 50 meter separation distance from a TV receiver antenna to prevent interference to the TV receiver. This is not the case. In fact, Intel's previous analysis recognized that in many cases operation close to a TV receiver will be required and will be possible. Table 1 below shows the free space path loss (between isotropic antennas at 300 MHz) that would be representative of the loss between an unlicensed device and a TV antenna at ranges from 1 to 6 meters. Due to low antenna efficiency and higher frequencies for most of the target channels, actual losses will be higher.

Range (m)	1	2	3	4	5	6
Loss (dB)	-22.0	-28.0	-31.5	-34.0	-36.0	-37.5

Table 1 Loss versus range

For low performance indoor antennas a range of 1 meter may be appropriate. But where outdoor high gain antennas are used, there will be additional propagation losses due to the walls/roof of the building. In those cases a distance of 20 meters may be appropriate. As stated above the recommended mode of operation of the unlicensed device will allow the output power to be controlled based on the signal strength of the adjacent channels and the FCC designated

protection range to a TV receiver antenna. This would allow operation as close as 1 meter to an isotropic antenna such as may be used for indoor applications.

The range achievable by the unlicensed system will depend upon the power transmitted by the unlicensed transmitter and the signal level in the adjacent interfering TV channel, see Figure 1.

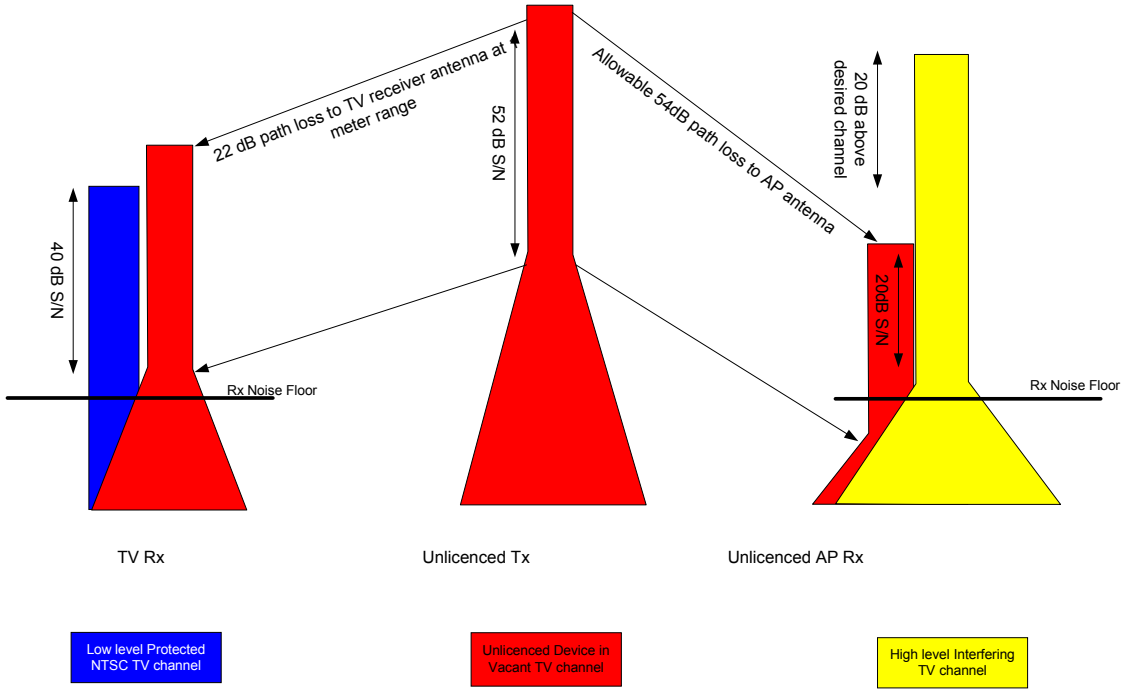
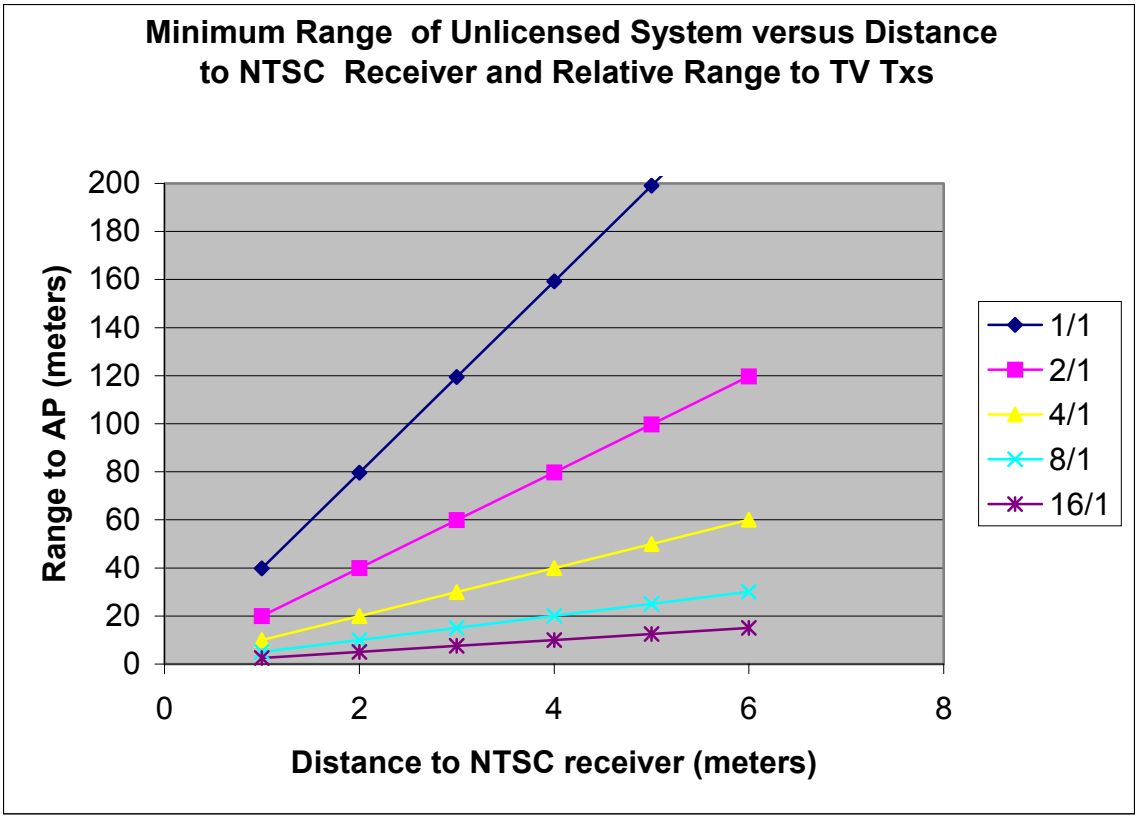


Figure 1 Illustration of protected and interfering NTSC TV channels

In the situation where two adjacent channels are at the same level, as would be the case for collocated TV Transmitters, ranges greater than 40 meters may be achieved even when protecting a receiver as close as 1 meter. This range is reduced where the interfering channel is much higher than the protected channel. This situation could arise when the protected channel is at the edge of the TV coverage but the interfering station is much closer. Figure 2 provides the achievable range, as a function of the ratio of distance to the interfering TV Transmitter to the distance to the desired Transmitter.

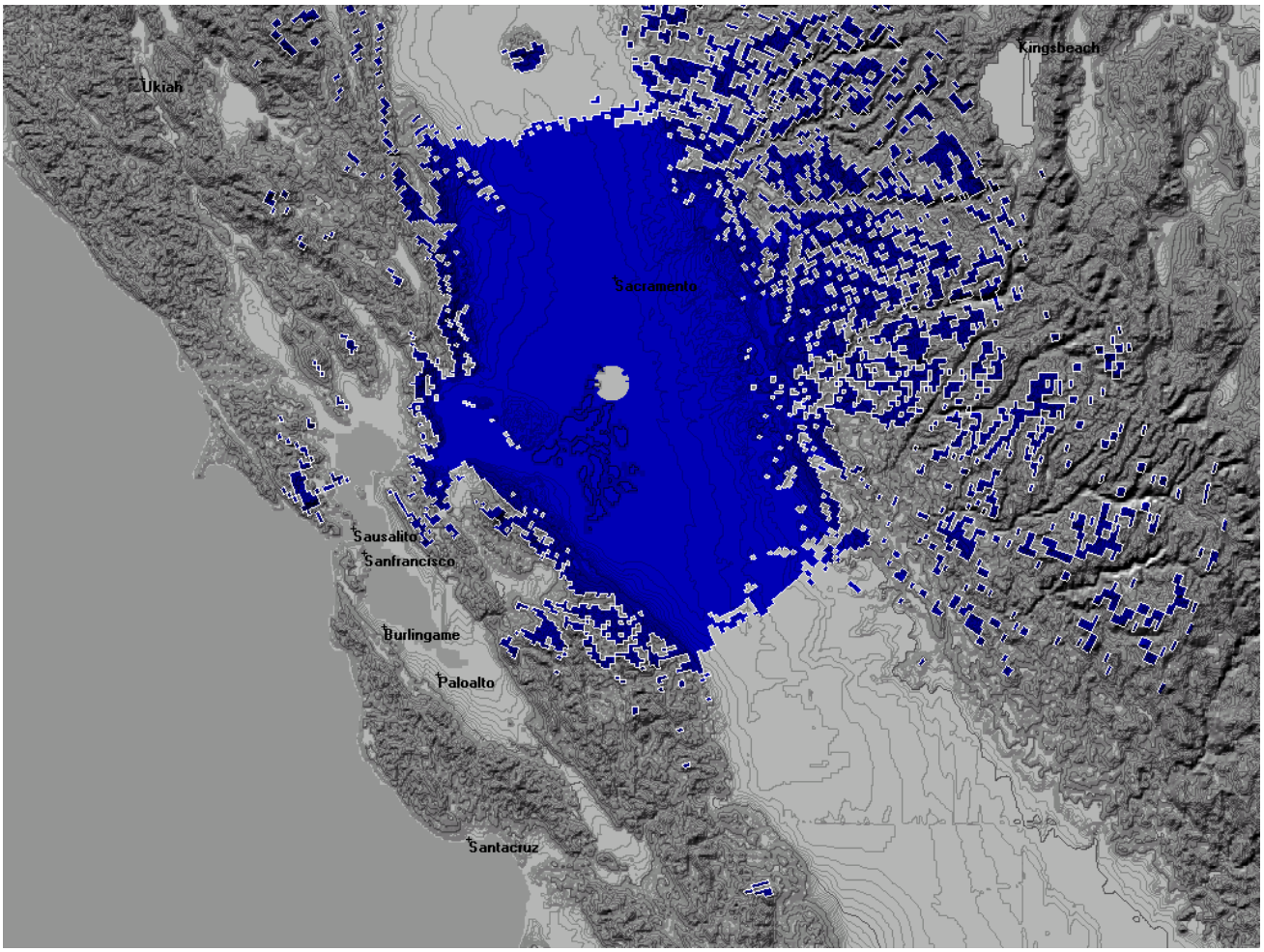


The same link analysis demonstrates that where the field strength of the TV channel to be protected is greater than the minimum useable field strength required for an acceptable picture that the unlicensed device could operate at higher power and communicate at a greater distance from an access point.

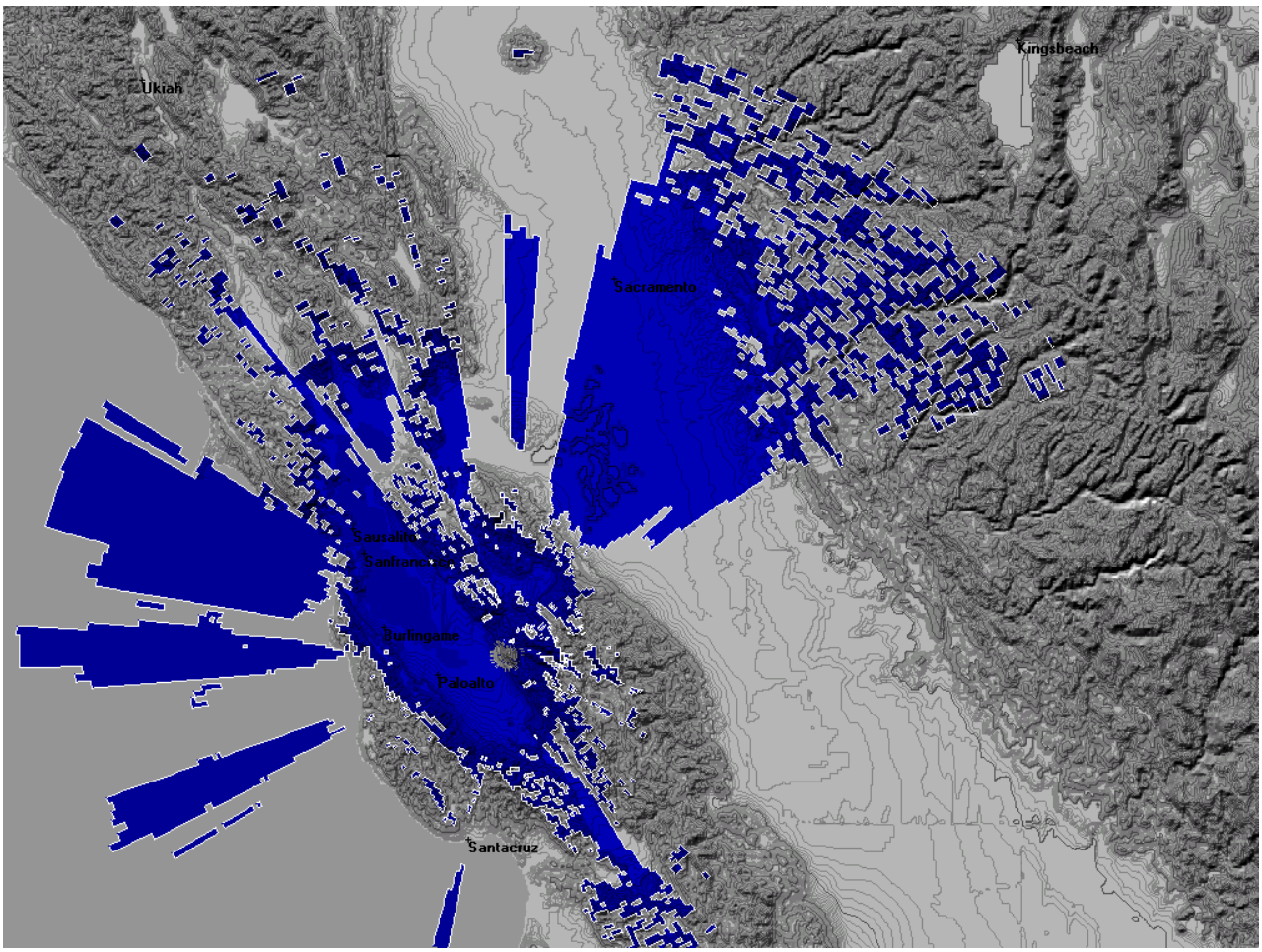
Thus, a smart unlicensed device operating in the TV band on a non interfering basis with TV receivers communicate (1) at distances comparable to existing wireless LAN devices in built up areas and (2) over extended ranges in rural areas.

Appendix A -Predicted Coverage Diagrams

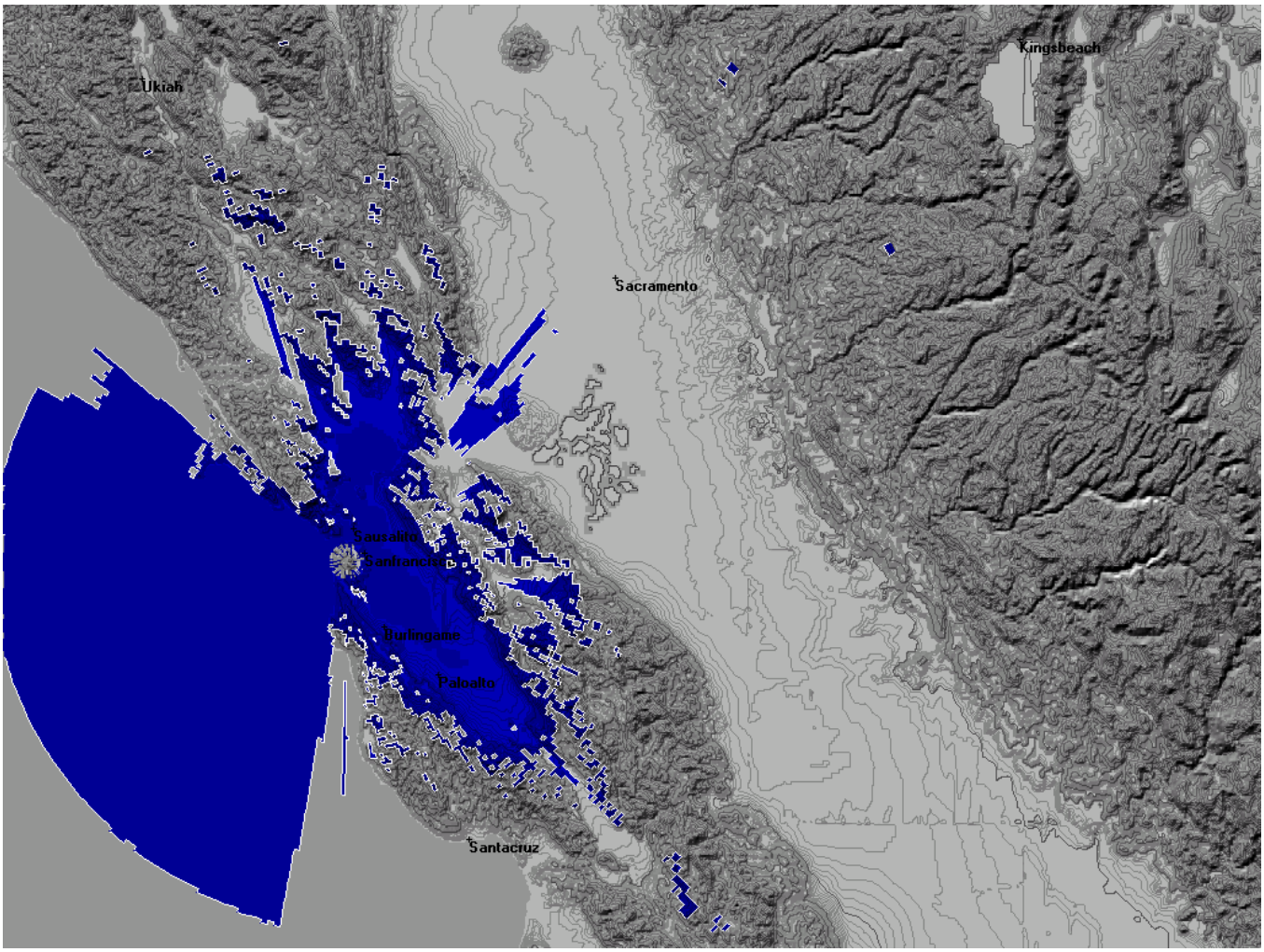
A1. Coverage of Sacramento and Stockton TV Transmitter sites
A2. Coverage from Northern San Jose TV Transmitter site
A3. Coverage from San Francisco/Vallejo/Oakland TV Transmitter Site



Coverage of Sacramento and Stockton TV Transmitter sites



Coverage from Northern San Jose TV Transmitter site



Coverage from San Francisco/Vallejo/Oakland TV Transmitter Site